



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/703,361	10/31/2000	Stepan Sokolov	SUN1P809/P5500	3228

22434 7590 03/25/2004  
BEYER WEAVER & THOMAS LLP  
P.O. BOX 778  
BERKELEY, CA 94704-0778

EXAMINER

BANANKHAH, MAJID A

ART UNIT	PAPER NUMBER
----------	--------------

2127

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/703,361

Applicant(s)

SOKOLOV, STEPAN

Examiner

Majid A Banankhah

Art Unit

2127

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2-3, 5.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

1. This office action is in response to application filed on April 25, 2000. Claims 1-23 are considered for examination.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Shaylor et al.

(U.S. Pat. No. 6,446,084).

Per claim 1, Shaylor teaches:

an internal class representation data structure embodied in a computer readable medium, the internal class representation being suitable for use by a virtual machine at runtime (col. 2, lines 16-22, *One embodiment of the present invention provides a method for increasing performance of code executing on a platform-independent virtual machine . The method operates by receiving a request to resolve an entry in a symbol table at run-time*), the internal class representation comprising:

a first method (Fig. 2, *method table 216*); and a reference cell that corresponds to the first method, the reference cell including, a class pointer field that can be used to locate an internal representation of a class (col. 6, lines 16, *the system uses the class pointer*, and col. 7, lines 16-18, *Finally, the system returns a class pointer (state 436). An example code listing for the class resolution process appears in Table 2*), a method name field that contains or references the name of the first method (col. 6, lines 16-17, *the system uses the **method name** and the type information*), and a signature field that contains or references a signature associated with the first method (col. 6, lines 16-18, *The system uses the class pointer, the method name and the type information (**signature**) to lookup a method pointer in method table 216 from FIG. 2 (state 414)*).

Per claim 2, wherein the reference cell further includes:

Art Unit: 2127

an information field arranged for containing or referencing information generated at runtime by the virtual machine (col. 2, lines 19-31, *The method operates by receiving a request to resolve an entry in a symbol table at run-time, wherein resolving the entry requires multiple lookups into the symbol table. It next determines if the entry has previously been resolved. If so, the system returns a direct pointer to a runtime structure associated with the entry, which was returned during a previous resolution of the entry. If not, the system resolves the entry through multiple lookups into the symbol table to produce a direct pointer to the runtime structure, and replaces the entry with the direct pointer. In a variation on the above embodiment, the symbol table assumes the form of a constant pool within an object-oriented class file defined within the JAVA programming language*);

and a link field arranged to contain information suitable for directly or indirectly linking the reference cell to the internal class representation (col.4, lines 10-16, *Next, class file 118 is transferred from JAVA development unit 108 through communication link 112, and into database 114 within compact computing device 110. Finally, virtual machine 116 executes a program that accesses components within class file 118. These accesses cause time-consuming constant pool resolution operations, which are optimized by this invention*).

Per claim 3, the reference cells are connected using a linked list construct (col. 6, lines 9-2, the index 410).

Per claims 3, 4, and 7 the reference cells are connected using a linked list construct, and further comprising a plurality of said methods and a plurality of said reference cells, wherein each reference cell corresponds to a unique one of the methods (col. 6, lines 9-21, *Next, the system retrieves an index for the name and type of the field (state 422), and uses this index to call a name and type subroutine to resolve the name and type (state 424). The system uses the class pointer, the field name and the type information (signature) to lookup a field pointer in field table 220 from FIG. 2 (state 428)*).

Per claim 5, wherein the signature is an internal representation of a signature that is directly usable by the virtual machine at runtime (See, col. 2, lines 26-29, *If not, the system resolves the entry through multiple lookups into the symbol table to produce a direct pointer to the runtime structure, and col. 6, lines 16-19, The system uses the class pointer, the method name and the type information (signature) to lookup a method pointer in method table 216 from FIG. 2 (state 414). Finally, the system returns this method pointer (state 416)*).

Per claim 6, a virtual machine that includes a plurality of internal class representations as recited in claim 1 (Fig. 2, 216, 218, 220, and 222).

Per claims 8, and 9, wherein each internal class representation represents a Java class and does not include a Constant Pool (col. 4, lines 49-64, *The next time virtual machine 116 accesses the same constant pool entry, it simply reads the value stored in the data fields of the entry instead of*

Art Unit: 2127

*performing a full constant pool lookup. Note that this requires to additional data storage space. Also note that modifying the tag field adds no additional storage overhead to the constant pool).*

Per claims 10-11, wherein the first method is likely to be invoked (col. 8, lines 63-66, *The first byte contains the instruction "Oxb6," which specifies an "invoke virtual" operation, which invokes a method that is specified by a following constant pool index*).

12. In a virtual machine based computing system that uses internal class representations to represent class files (col. 3, lines 29-34, *FIG. 1 illustrates one embodiment of a computer system 106, which loads a class file onto a compact computing device 110 in accordance with an embodiment of the present invention. In FIG. 1, computer system 106 may be any type of computer system capable of executing an application program*), a process of loading a class files into the computing system comprising:

populating a first internal class representation that corresponds to the class file, wherein the populated first internal class representation includes at least one internal method invocation suitable for invoking an associated method (col. 8, lines 63-66, *The first byte contains the instruction "Oxb6," which specifies an "invoke virtual" operation, which invokes a method that is specified by a following constant pool index*); and

reviewing at least one method invocation to determine whether a reference cell currently exists for its associated method (col. 6, lines 9-21, *Next, the system retrieves an index for the name and type of the field (state 422), and uses this index to call a name and type subroutine to resolve the name and type (state 424). The system uses the class pointer, the field name and the type information (signature) to lookup a field pointer in field table 220 from FIG. 2 (state 428)*), wherein when it is determined that a reference cell does not currently exist for a selected method associated with the method invocation, the process further comprises creating a new reference cell for the selected method, the newly created reference cell being associated with an internal class representation that contains the invoked method (col. 4, lines 40-47, *Field table 220 includes the values of fields associated with the particular class. The entries in field table 220 are typically stored as data values. However, they may additionally include pointers to data values*).

Per claims 13, and 14, the limitation of wherein said reviewing is performed only when the at least one method is likely to be invoked, taught by Shaylor because when a method is invoked a new frame is created and becomes current when control transfers to the new method. On return from the method, the current frame passes the result from the method invocation to the current method.

Per claim 15, wherein the loaded class file further includes a Constant Pool and at least one class file method invocation that references the Constant Pool, the process further comprising translating each class file method invocation into an associated internal method invocation that references a selected reference cell associated with the internal class representation that contains the method corresponding to the method invocation (col. 4, lines 3-16, *During operation class*

Art Unit: 2127

*file, 118 is created within JAVA development unit 108. class file 118 contains components of a platform-independent program to be executed in compact computing device 110. For example, class file 118 may include methods and fields associated with an object-oriented class. Class file 118 additionally includes constant pool 206 as is described in more detail below. Next, class file 118 is transferred from JAVA development unit 108 through communication link 112, and into database 114 within compact computing device 110. Finally, virtual machine 116 executes a program that accesses components within class file 118).*

Per claims 16-18, see the rejection of claims 5-7 above.

Per claim 19, a virtual machine based computing system that uses internal class representations to represent class files (col. 3, lines 29-34, *FIG. 1 illustrates one embodiment of a computer system 106, which loads a class file onto a compact computing device 110 in accordance with an embodiment of the present invention. In FIG. 1, computer system 106 may be any type of computer system capable of executing an application program, and col. 8, lines 63-66, The first byte contains the instruction "Oxb6," which specifies an "invoke virtual" operation, which invokes a method that is specified by a following constant pool index*), a process of loading a class file that includes a Constant Pool and at least one method invocation that references the Constant Pool into the computing system, the process comprising translating at least one method invocation into an internal invocation that references a reference cell associated with the internal class representation that contains the method (col. 4, lines 17-39, *FIG. 2 illustrates the structure of class file 118 and associated runtime structures in accordance with an embodiment of the present invention. FIG. 2 includes class file 118, method table 216, field table 220 and list of classes 222. Class file 118 includes a number of different types of information related to a particular class, including class file identification information 204, constant pool 206, general class information 208, field information 210 and method information 212. Class identification information 204 contains information that identifies the particular class. Constant pool 206 includes a number of entries for storing symbolic information for the particular class. General class information 208 includes information that identifies the superclass to which the particular class belongs. Field information 210 includes information relating to the various variables and data structures associated with the particular class. Method information 212 includes the actual bytecodes to implement the methods defined for the particular class. Method table 216 includes pointers to the actual bytecodes that implement the methods defined within the particular class. This includes bytecode 218, which includes a string of bytes to be executed by virtual machine 116 in FIG. 1).*

Per claims 20-23, see the rejection of claims 45, and 10-11.

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 2127

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Majid A. Banankhah** whose voice telephone number is **(703) 308-6903**. A voice mail service is also available at this number.

All response sent to U.S. Mail should be mailed to:

**Commissioner of Patent and Trademarks  
Washington, D.C. 20231**

**Hand-delivered responses should be brought to Crystal Park Two, 2021 Crystal Drive, Arlington, VA, Six Floor (Receptionist).** All hand-delivered responses will be handled and entered by the docketing personnel. Please do not hand deliver responses to the Examiner.

**All Formal or Official Faxes must be signed and sent to either (703) 308-9051 or (703) 308-9052.** Official faxes will be handled and entered by the docketing personnel. The date of entry will correspond to the actual FAX reception date unless that date is a Saturday, Sunday, or a Federal Holiday within the District of Columbia, in which case the official date of receipt will be the next business day. The application file will be promptly forwarded to the Examiner unless the application file must be sent to another area of the office, e.g., Finance Division for fee charging, etc.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is **(703) 305-9600**.

Majid Banankhah

3/21/04

  
**MAJID BANANKHAH  
PRIMARY EXAMINER**